

BMP #21 - Inlet Protection

Targeted Pollutants

- ☒ Sediment
- ☐ Phosphorus
- ☐ Trace metals
- ☐ Bacteria
- ☐ Petroleum hydrocarbons

Physical Limits

Drainage area 1 ac
Max slope 5%
Min bedrock depth 2 ft
Min water table 2 ft
SCS soil type ABCD
Freeze/Thaw good
Drainage/Flood control no

DESCRIPTION

Inlet protection consists of a filtering measure placed around an inlet or drain to trap sediment and prevent the sediment from entering the storm drain system. Additionally, it serves to prevent the silting-in of inlets, storm drainage systems, or receiving channels. Inlet protection may be composed of gravel and stone with a wire mesh filter, block and gravel, filter fabric, or sod. Care must be taken not to cause flooding with diverted flow.

APPLICATIONS

Inlet protection is appropriate for small drainage areas (less than 1 acre) where storm drains will be ready for use before the drainage area reaches final stabilization. Storm drain inlet protection is also used where:

- A permanent storm drain structure is being constructed on site and there is danger of sediment silting it in before permanent site stabilization.
- There is a threat of sediment silting in an inlet which is in place prior to permanent stabilization.
- Ponding around the inlet structure could be a problem to traffic on site.

Filter fabric is used for inlet protection when storm water flows are relatively small, with low velocities. Filter fabric inlet protection is appropriate for most types of inlets where the drainage area is 1 acre or less.

Block and gravel filters can be used where velocities are higher. They may be used with most types of inlets where overflow capability is needed and in areas of heavy flows (238 gal/min (15 liters/second) or greater).

Gravel and mesh filters can be used where flows are higher and in locations subject to disturbance by site traffic. This type of protection may be used with most inlets where overflow capability is needed and in areas of heavy flows (238 gal/min (15 liters/second) or greater).

Sod inlet filters are usually used where sediments in the storm water runoff are low.

LIMITATIONS

Filter fabric inlet protection cannot be used where inlets are paved because the fabric must be staked.

Straw bales (BMP #24) are not recommended for inlet protection when the area adjacent to the inlet is paved. Additionally, the bales must be anchored. Consider sandbags (BMP #32) in situations where anchoring of straw bales is not possible (e.g., paved road surfaces).

Inlet protection is a high maintenance item compared with other more permanent measures.

DESIGN PARAMETERS

Several different designs are in use and the configurations vary. Most of the following design considerations apply to all three main types of inlet protection (filter fabric, gravel and mesh, and block and gravel). Some additional concerns apply to only one or two of the types.

Drainage area: Not to exceed 1 acre. Overland flow to the inlet should be no greater than 15 liters/second.

Slope gradient: The drainage area should be fairly flat, with slopes of 5 percent or less. With filter fabric designs, the area immediately surrounding the inlet should not exceed a slope of one percent.

Height of filter fabric: To avoid failure caused by pressure against the fabric when overtopping occurs, it is recommended that the height of the filter fabric be limited to 16 in (0.4 meters) above the crest of the drop inlet.

Sump: Where possible, a filter fabric or block-and-gravel protection device should be provided with a sediment trapping sump 12 to 20 in (300 to 500 mm) deep as measured from the crest of the inlet. Side slopes should be 2:1. The recommended volume of excavation is 860 ft³/acre (60 cubic meters/hectare) of ground disturbed.

Orientation: To achieve maximum trapping efficiency in gravel-and-mesh or block-and-gravel traps, the longest dimension of the basin should be oriented toward the longest inflow area.

Materials for filter fabric inlet protection:

- Filter fabric (see the fabric specifications for silt fence, BMP #25)
- Wooden stakes 2x2 in (50 mm x 50 mm) (or 2x4 in (50 mm x 100 mm)), with a minimum length of 3 ft (1.0 meter)
- Heavy-duty wire staples at least 45 in (10 mm) long
- Washed gravel 0.8 to 1.2 in (20 to 30 mm) in diameter, with less than 5 percent fines

Materials for excavated gravel inlet protection:

- Hardware cloth or wire mesh with 2/5 to 3/5 in (10 to 15 mm) openings
- Filter fabric (see the fabric specifications for silt fence, BMP #25)
- Washed gravel 0.8 to 4 in (20 mm to 100 mm) in diameter

Materials for block and gravel inlet protection:

- Hardware cloth or wire mesh with 2/5 to 3/5 in (10 to 15 mm) openings

- Filter fabric (see the fabric specifications for silt fence, BMP #25)
- Concrete blocks 4 to 12 in (100 mm to 300 mm) wide
- Washed gravel 0.8 to 4 in (20 mm to 100 mm) in diameter

CONSTRUCTION GUIDELINES

Filter fabric:

- Place a stake at each corner of the inlet and around the edges at no more than 3 ft (1 meter) apart. Drive the stakes into the ground 20 in (500 mm) if possible, or a minimum of 8 in (200 mm).
- For stability, install a framework of wood strips around the stakes at the crest of the overflow area, 20 in (500 mm) above the crest of the drop inlet.
- Excavate a trench 8 to 12 (200 to 300 mm) deep around the outside perimeter of the stakes. If a sediment trapping sump is being provided, then the excavation may be as deep as 2 ft (600 mm).
- Staple the filter fabric to the wooden stakes with heavy-duty staples, overlapping the joints to the next stake. Ensure that 12 to 32 in (300 to 800 mm) of filter fabric extends at the bottom so it can be formed into the trench.
- Place the bottom of the fabric in the trench and backfill the trench all the way around, using washed gravel to a minimum depth of 4 in (100 mm). Use enough gravel to ensure contact between the filter fabric and the underlying surface.

Gravel and mesh:

- Remove any obstructions to excavating and grading. Excavate sump area, grade slopes, and properly dispose of soil.
- Secure the inlet grate to prevent seepage of sediment-laden water.
- Place wire mesh over the drop inlet so the wire extends a minimum of 300 mm beyond each side of the inlet structure. Overlap the strips of mesh if more than one is necessary.
- Place filter fabric over the mesh, extending it at least 500 mm beyond the inlet opening on all sides. Ensure that weep holes in the inlet structure are protected by filter fabric and gravel.
- Place stone or gravel over the fabric/wire mesh to a depth of at least 300 mm

Block and gravel:

- Secure the inlet grate to prevent seepage of sediment-laden water.
- Place wire mesh over the drop inlet so the wire extends a minimum of 12 to 20 in (300 mm to 500 mm) beyond each side of the inlet structure. Overlap the strips of mesh if more than one is necessary.

- Place filter fabric (optional) over the mesh and extend it at least 20 in (500 mm) beyond the inlet structure.
- Place concrete blocks over the filter fabric in a single row lengthwise on their sides along the sides of the inlet. Excavate the foundation a minimum of 2 in (50 mm) below the crest of the inlet. The bottom row of blocks should be against the edge of the structure for lateral support.
- The open ends of the block should face outward, not upward, and the ends of adjacent blocks should abut. Lay one block on each side of the structure on its side to allow for dewatering of the pool.
- The block barrier should be at least 12 in (300 mm) high and may be up to a maximum of 24 in (600 mm) high. It may be from 4 to 12 in (100 mm to 300 mm) deep, depending on the size of block used.
- Prior to backfilling, place wire mesh over the outside vertical end of the blocks so that stone does not wash down the inlet.
- Place gravel against the wire mesh to the top of the blocks.

Swale, ditch line or yard inlet protection:

- Excavate completely around inlet to a depth of 18" below notch elevation.
- Drive 2 x 4 post 1' into ground at four corners of inlet. Place nail strips between posts on ends of inlet. Assemble top portion of 2 x 4 frame using overlap joint shown. Top of frame (weir) must be 6" below edge of roadway adjacent to inlet.
- Stretch wire mesh tightly around frame and fasten securely. Ends must meet at post.
- Stretch filter cloth tightly over wire mesh, the cloth must extend from top of frame to 18" below inlet notch elevation. Fasten securely to frame. Ends must meet at post, be overlapped and folded, then fastened down.
- Backfill around inlet in compacted 6" layers until layer of earth is even with notch elevation on ends and top elevation on sides.
- If the inlet is not in a low point, construct a compacted earth dike in the ditch line below it. The top of the dike is to be at least 6" higher than the top of frame (weir).
- This structure must be inspected frequently and the filter fabric replaced when clogged.

Curb Inlet Protection:

- Attach a continuous piece of wire mesh (30" min. width by throat length plus 4') to the 2" x 4" weir (measuring throat length plus 2') as shown on the standard drawing.
- Place a piece of approved filter cloth (40-85 sieve) of the same dimensions as the wire mesh over the wire mesh and securely attach to the 2" of 4" weir.

- Securely nail the 2" x 4" weir to 9" long vertical spacers to be located between the weir and inlet face (max. 6' apart).
- Place the assembly against the inlet throat and nail (minimum 2") lengths of 2" x 4" to the top of the weir at spacer locations. These 2" x 4" anchors shall extend across the inlet top and be held in place by sandbags or alternate weight.
- The assembly shall be placed so that the end spacers are a minimum 1' beyond both ends of the throat opening.
- Form the wire mesh and filter cloth to the concrete gutter and against the face of curb on both sides of the inlet. Place clean 2" stone over the wire mesh and filter fabric in such a manner as to prevent water from entering the inlet under or around the filter cloth.
- This type of protection must be inspected frequently and the filter cloth and stone replaced when clogged with sediment.

Assure that storm flow does not bypass inlet by installing temporary earth or asphalt dikes directing flow into inlet.

MAINTENANCE

- Inspect regularly and after every storm. Make any repairs necessary to ensure the measure is in good working order.
- Remove accumulated sediment and restore the trap to its original dimensions when sediment has accumulated to half the design depth of the trap. All sediments removed must be disposed of properly.
- On gravel-and-mesh devices, clean (or remove and replace) the stone filter or filter fabric if it becomes clogged.
- On filter fabric devices, replace the fabric immediately if it becomes clogged. Make sure the stakes are firmly in the ground and that the filter fabric continues to be securely anchored.
- Inlet protection should remain in place and operational up to 30 days after the drainage area is completely stabilized.

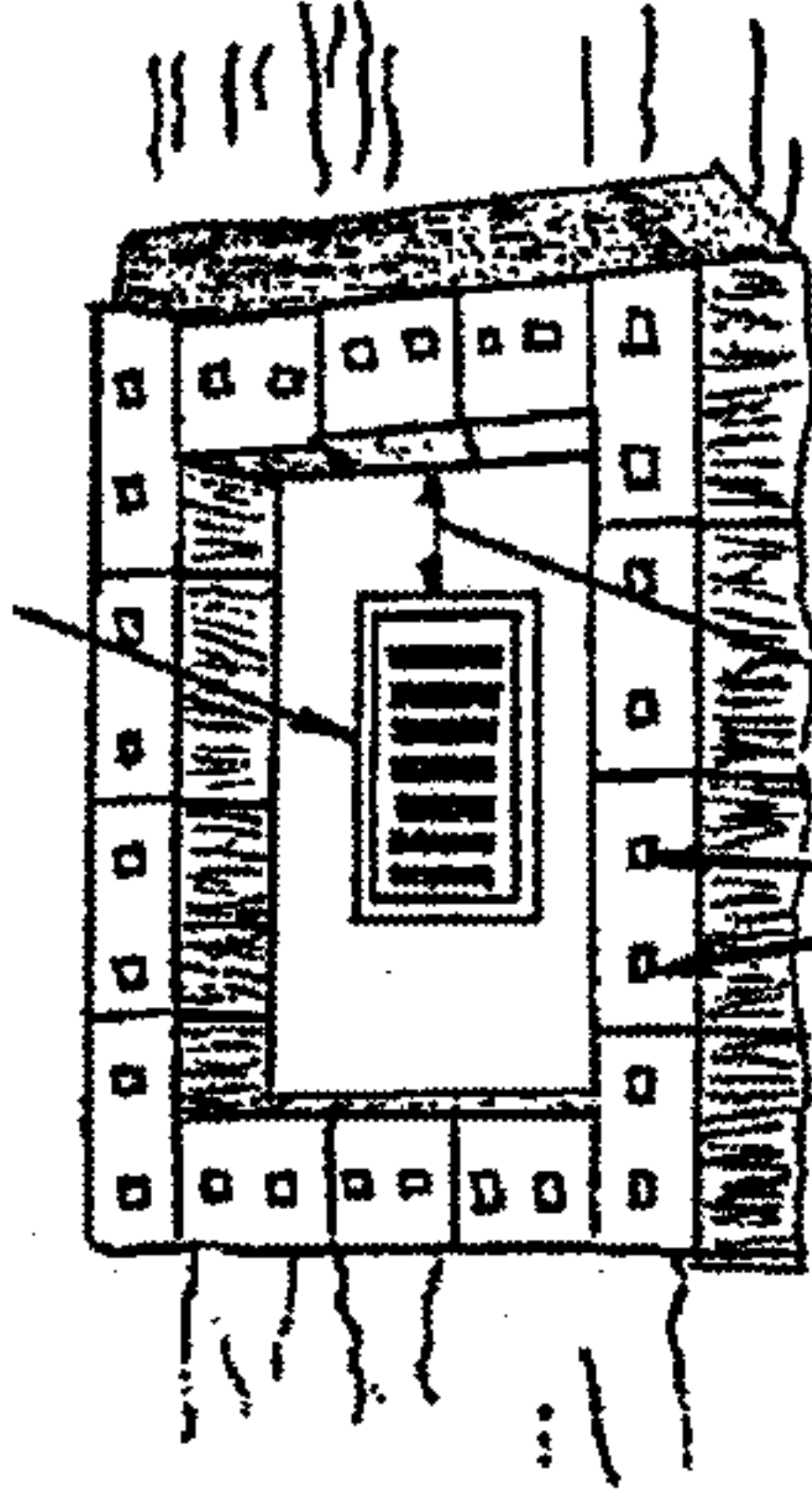
Compacted
soil to prevent
piping

Drop inlet with grate

Runoff
water with
sediment

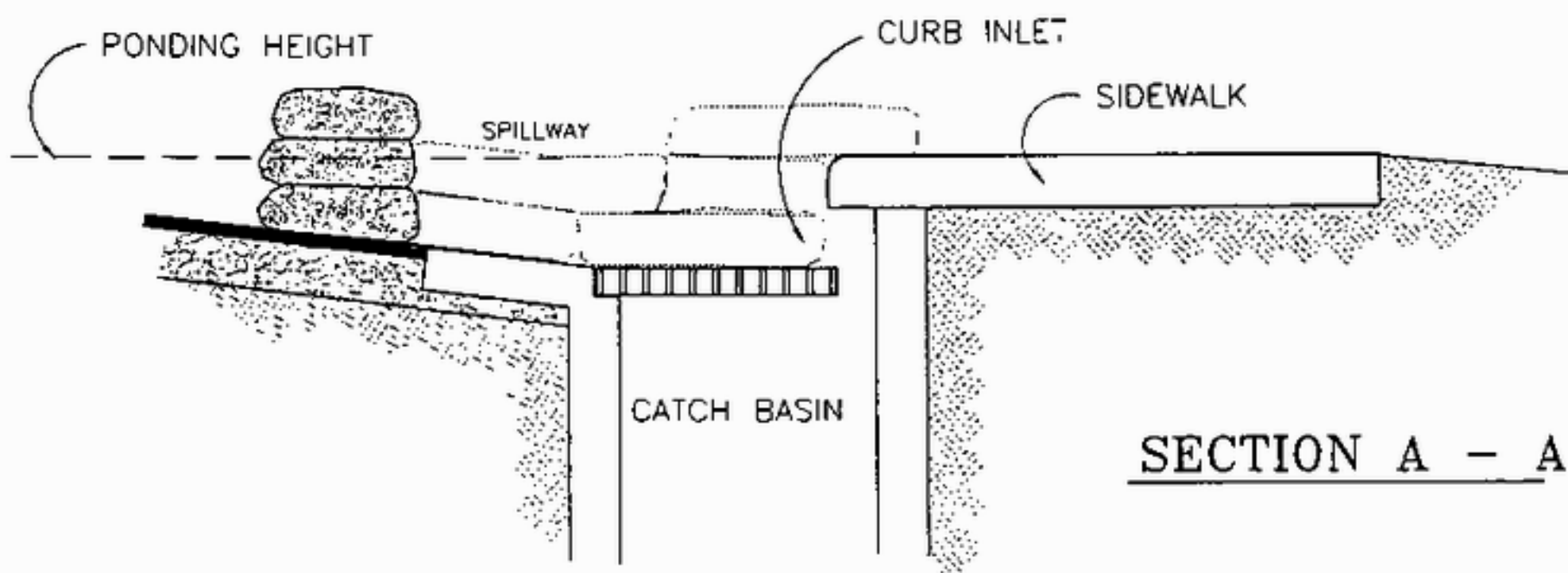
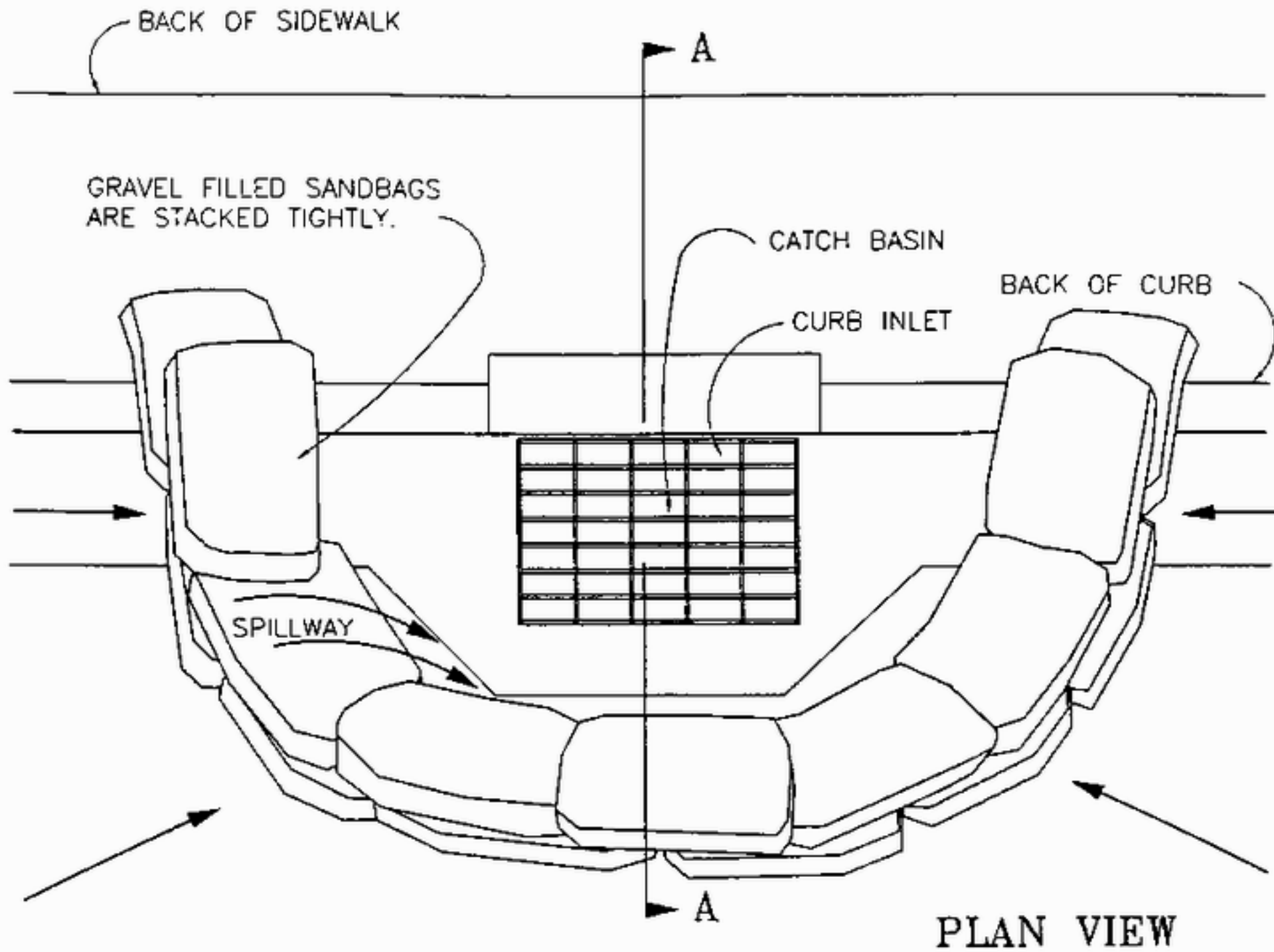
Staked
straw bale

Filtered
water



Bales 12-24"
from inlet

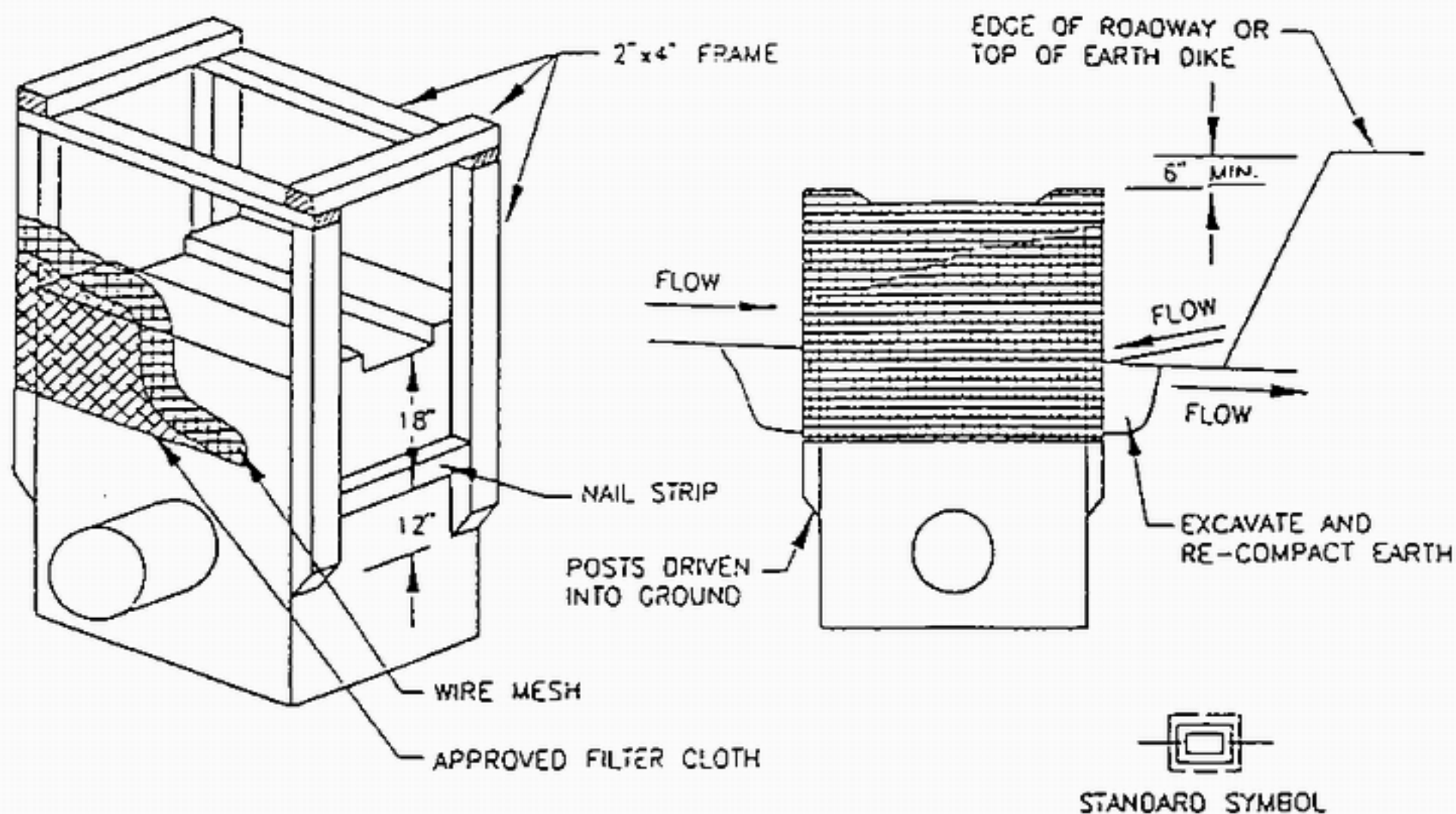
Straw bales
staked with 2
stakes per bale



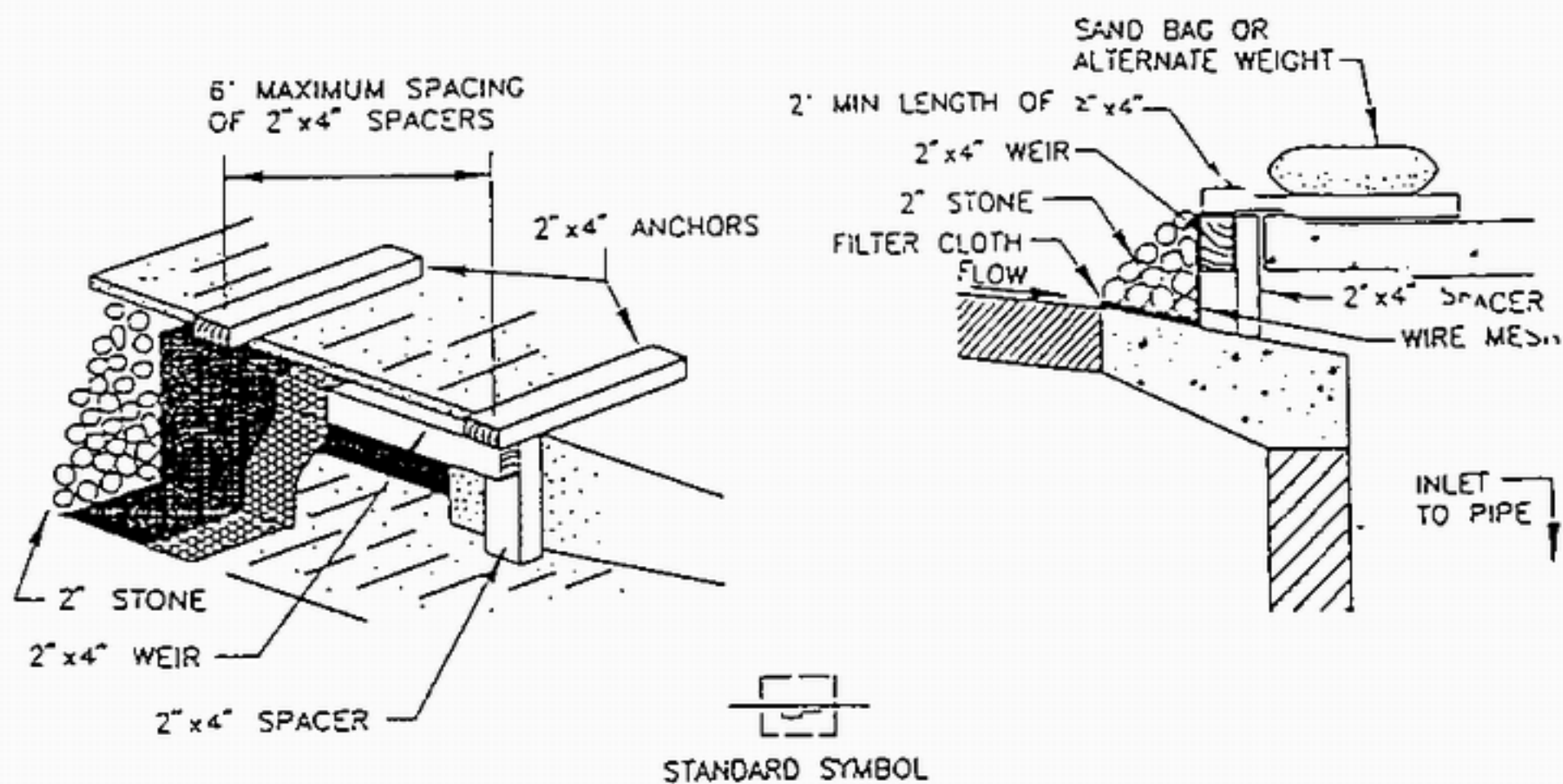
NOTES:

1. PLACE CURB TYPE SEDIMENT BARRIERS ON GENTLY SLOPING STREET SEGMENTS, WHERE WATER CAN POND AND ALLOW SEDIMENT TO SEPARATE FROM RUNOFF.
2. SANDBAGS, OF EITHER BURLAP OR WOVEN GEOTEXTILE FABRIC, ARE FILLED WITH GRAVEL, LAYERED AND PACKED TIGHTLY.

3. LEAVE ONE SANDBAG GAP IN THE TOP ROW TO PROVIDE A SPILLWAY FOR OVERFLOW.
4. INSPECT BARRIERS AND REMOVE SEDIMENT AFTER EACH STORM EVENT. SEDIMENT AND GRAVEL MUST BE REMOVED FROM THE TRAVELED WAY IMMEDIATELY.



SWALE INLET PROTECTION DETAIL



CURB INLET PROTECTION DETAIL

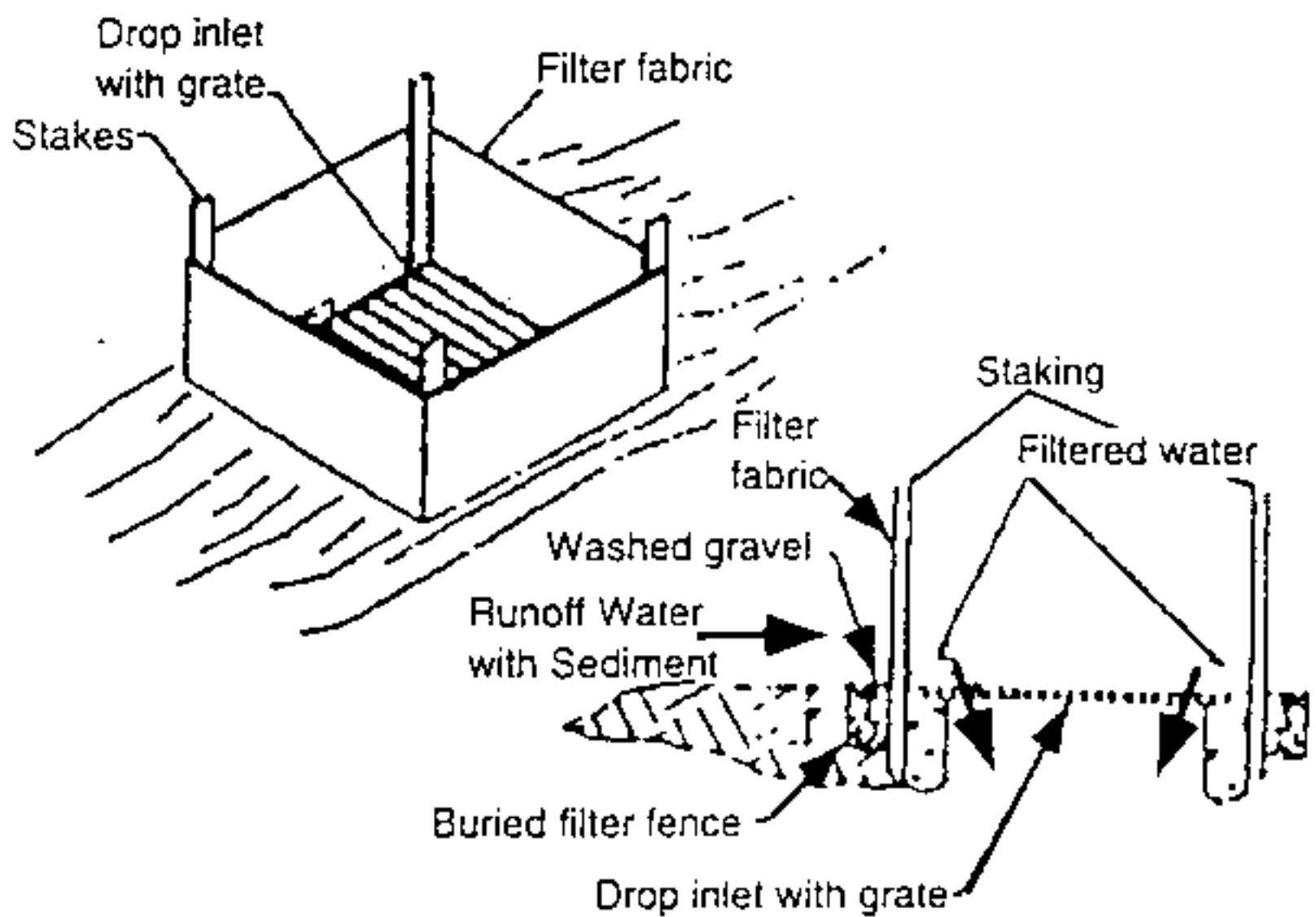
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TOOTHMAN-ORTON ENGINEERING COMPANY
BOISE, IDAHO McCALL, IDAHO

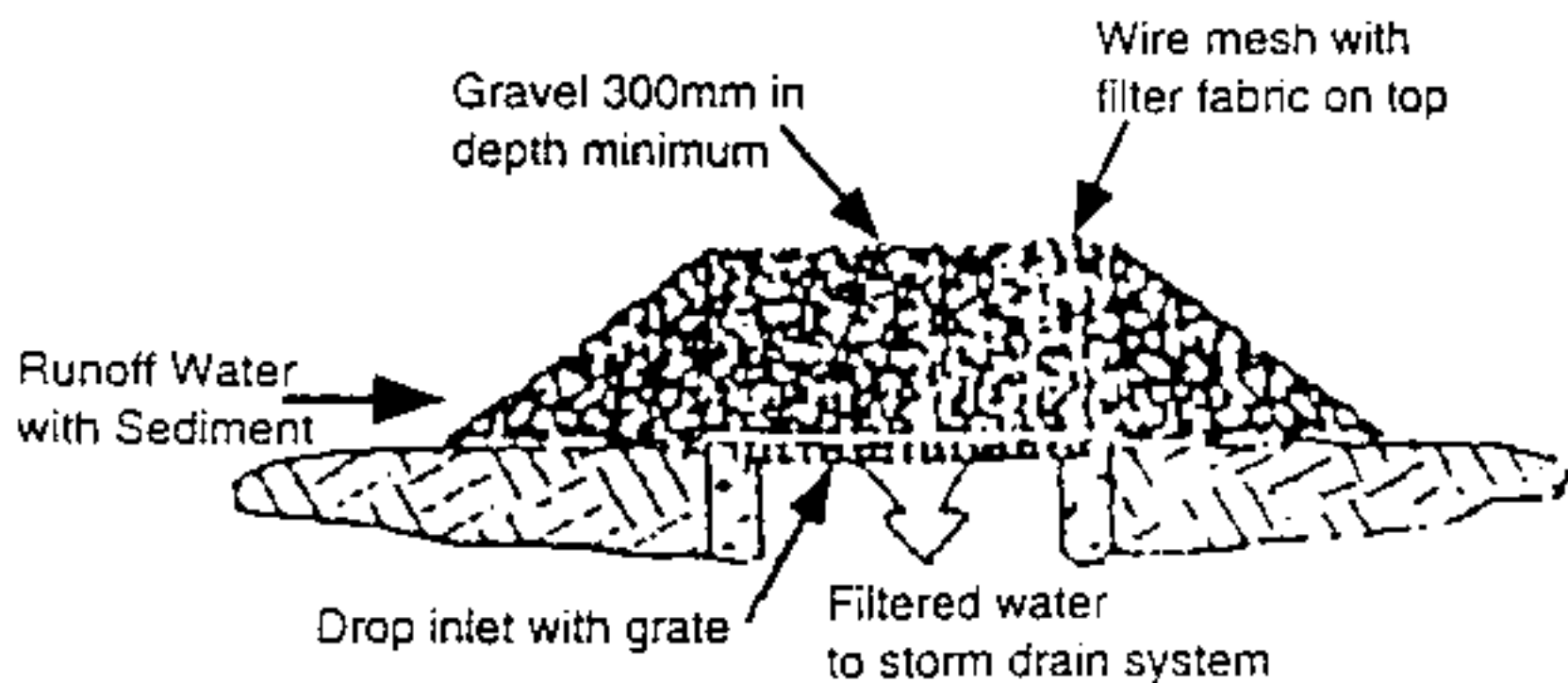
INLET PROTECTION
DETAIL

STANDARD
DRAWING

IPD-1



FILTER FABRIC FENCE INLET FILTER



GRAVEL AND WIRE MESH FILTER SECTION